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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/823,491	03/31/2001	James W. Edwards	042390P10503	6546

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EXAMINER

PYZOCHA, MICHAEL J

ART UNIT

PAPER NUMBER

2137

DATE MAILED: 11/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/823,491

Applicant(s)

EDWARDS ET AL.

Examiner

Michael Pyzocha

Art Unit

2137

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) •
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 2137

DETAILED ACTION

1. Claims 1-33 are pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 12, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kettlewell (webpage), and further in view of Koopman (webpage).

As per claims 1, 12, and 23, Kettlewell discloses the method, apparatus and medium for executing a modified call routine for placing a random amount of empty space onto a stack (see page 3), executing a called function (see page 4).

Kettlewell fails to disclose a modified return routine for removing said random amount of empty space from the stack.

However, Koopman teaches removing data from a stack (see pages 1-2).

Art Unit: 2137

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Koppman's method of removing data from a stack to remove the random space of Kettlewell.

Motivation to do so would have been to prevent the stack from overflowing (see Koopman Figure 1.1 where after 9 is pushed onto the stack if it is not removed the stack will overflow).

4. Claims 2-4, 8-11, 13-15, 19-22, 24-26, 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Kettlewell and Koopman system as applied to claims 1, 12, 23 above, and further in view of Cowan et al (webpage).

As per claims 2, 13, and 24, the modified Kettlewell and Koopman system discloses calculating a random number; saving said random number in a secure location; placing a plurality of blank bytes equal to the random number onto the stack (Kettlewell page 3); and setting an end of stack pointer to an end of the stack frame (see Koopman page 2 section 1.2.2 paragraph 1).

The modified Kettlewell and Koopman system fails to disclose placing a return address for the called function on the stack; and building a stack frame by placing values from the called function onto the stack.

Art Unit: 2137

However Cowan et al teaches placing a return address for the called function on the stack (see Cowan et al page 7 figure 2); building a stack frame by placing values from the called function onto the stack (see Cowan et al figure 2).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Cowan et al's method of adding the return address onto the stack and building a stack from in the modified system of Kettlewell and Koopman.

Motivation to do so would have been to allow the stack to return to its original location (see Cowan et al page 4).

As per claims 3, 14, and 25, the modified Kettlewell, Koopman and Cowan et al system discloses the secure location being a register not generally accessible (see Cowan et al figure 3)

As per claims 4, 15, and 26, the modified Kettlewell, Koopman and Cowan et al system discloses the modified return routine comprises: recalling a random number saved during an execution of said modified call routine (see Cowan et al figure 4 line 1 where the canary is the random space of Kettlewell); removing a number of bytes equal to said random number from the stack (see Cowan et al figure 4 line 3); retrieving a return address for the called function from the stack (see Cowan et al page 7 first paragraph); and setting an end of stack pointer to

Art Unit: 2137

an end of a previous stack frame (see Koopman page 2 section 1.2.2 paragraph 1).

As per claims 8, 19, and 30, the modified Cowan et al and Koopman system discloses searching an executable program for all function calls at the time the executable is installed; adding a random amount of blank space to all stacks generated by said function calls (see Kettlewell page 3); adjusting all references to said stacks to compensate for said blank space (see Koopman page 2 section 1.2.2 paragraph 1).

As per claims 9-11, 20-22, and 31-33, the modified Cowan et al and Koopman system discloses the method is performed when the executable is installed or loaded and saving the executable (see Cowan et al page 8 where running a program through the compiler is a way of installation and it is inherent that the compiler will at least temporarily save the outputted executable).

5. Claims 5-7, 16-18, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the modified Kettlewell, Koopman and Cowan et al system as applied to claims 1, 12, 23 above, and further in view of Menezes et al (Handbook of Applied Cryptography).

As per claims 5, 16, and 27 the modified Kettlewell, Koopman and Cowan et al system discloses placing a return address for the called function on the stack (see Cowan et al

Art Unit: 2137

figure 2) and building a stack frame by placing values from the called function onto the stack (see Cowan et al figure 2).

The modified Kettlewell, Koopman and Cowan et al system fails to disclose calculating a hash value and storing a hash value of the stack invariants.

However, Menezes et al teaches the use of hash values for message integrity (see page 323 and it is inherent that the hash must be done on invariants and that it must be stored in order to check the integrity).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Menezes et al's hash function in the modified Kettlewell, Koopman and Cowan et al system.

Motivation to do so would have been to provide content integrity (see Menezes et al page 323)

As per claims 6, 17, and 28, the modified Kettlewell, Koopman, Cowan et al and Menezes et al system discloses the secure location is a processor register that is not generally accessible (see Cowan et al figure 3).

As per claims 7, 18, and 29, the modified Kettlewell, Koopman, Cowan et al and Menezes et al system discloses calculating a second hash value of stack invariants; determining whether said second hash value matches a first hash value

Art Unit: 2137

calculated during an execution of said modified call routine (see Menezes et al page 323); executing a stack corruption exception if said second hash value does not match said first hash value; and setting an end of stack pointer to an end of a previous stack frame if said second hash value matches said first hash value (see Cowan et al figure 4).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Pyzocha whose telephone number is (571) 272-3875. The examiner can normally be reached on 7:00am - 4:30pm first Fridays of the bi-week off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Caldwell can be reached on (571) 272-3868. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2137

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJP

Andrew Caldwell
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